MAT 331-Fall 20: Homework 2

Exercice 1. *Consider a sequence (S_n) given by the conditions $S_0 = S_1 = 1$ and the recursive formula:*

$$S_n = 3S_{n-1} + 2S_{n-2}, \tag{1}$$

for all $n \geq 2$.

(a) *(1 point) Write a recursive function **rec_ sequence(n)** which takes n and returns the value S_n. (test your code by printing S_0, S_1, S_2, S_3, S_4)*

(b) *(1 point) Using a **for loop**, write a function , **for_ sequence(n)** which takes n and returns the value S_n. (test your code by printing S_0, S_1, S_2, S_3, S_4)*

(c) *(2 points) Estimate the memory consumption and complexity for each of these codes. (Explain carefully your computations)*

Exercice 2. *(Newton method) The purpose of this exercice is to compute the square root of a number a, with or without using the standard math functions.*

(a) *(1 point) Write a function **usual_ sqrt(a)** which takes a floating number a and returns $\sqrt{a}$ using the standard math functions if $a \geq 0$, or prints an error if $a < 0$ and returns -1.*

(b) *(3 points) Using the Newton method, write a function **newton_ sqrt(a, epsilon)** which take a floating number a and $\epsilon > 0$ and returns a value σ where $|\sigma - \sqrt{a}| < \epsilon$ if $a \geq 0$, or prints an error if $a < 0$ and returns -1.*

(c) *(2 points) For $a = 13$ and a precision $\epsilon = 10^{-7}$. How many times do you apply the newton recursion formula in **newton_ sqrt**$(13, 10^{-7})$? (Hint: use global variables)*